

WHAT IS CLAIMED AS NEW AND DESIRED TO BE SECURED BY LETTERS PATENT
OF THE UNITED STATES IS:

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1. A method of forming a layer of metal on a substrate, comprising:
 - i) depositing a seed layer of the metal on a first substrate surface, said seed layer being sufficient to cover said first substrate surface;
 - ii) depositing a second amount of metal on said seed layer at a substrate temperature and power, providing a metal diffusion rate and a second metal deposition rate sufficient to inhibit void formation in an opening having an aspect ratio of at least 1.0; and
 - iii) depositing a third amount of metal on said second amount of metal.
 2. The method of Claim 1, wherein said substrate further comprises an opening.
 3. The method of Claim 2, further comprising, before step i) forming a barrier/liner layer in said via channel.
 4. The method of Claim 3, wherein step ii) is conducted at a substrate temperature and power sufficient to inhibit formation of filamentous metal phases with said barrier/liner layer, having a resistivity greater than that of said metal.
 5. The method of Claim 1, wherein said second amount of metal is deposited at a rate of about 5 to 30 Å/sec.
 6. The method of Claim 1, wherein said second amount of metal is deposited at a pressure of 4 to 6 mtor.
 7. The method of Claim 1, wherein said second amount of metal is deposited at a substrate temperature of 300 to 420°C.
 8. The method as in Claim 1, wherein said second amount of metal is deposited to form a

layer of 400 to 3,000 Å thick.

9. The method as in Claim 1, wherein said metal is aluminum.

10. The method as in Claim 1, said seed layer is deposited at a power of 9,000 W.

11. The method of Claim 1, wherein said seed layer is deposited at a pressure of 1 to 3 mtorr.

12. The method of Claim 1, wherein said seed layer is deposited at a rate of 100 to 300 Å/sec.

13. The method of Claim 1, wherein said seed layer is deposited to form a layer of 500 to 4,000 Å.

14. The method of Claim 1, wherein heating of said substrate in said second step is by backside gas flow.

15. The method of Claim 14, wherein said gas is Ar.

16. The method of Claim 2, wherein said opening has an aspect ratio of at least 3:1 (W/H).

17. The method of Claim 2, wherein said second amount of metal deposited is sufficient to fill said opening.

18. The method of Claim 2, further comprising forming a liner/wetting layer is deposited in said opening before step i).

19. The method of Claim 1, wherein said second amount of metal is deposited at a power of 100 to 800 W.

20. The method of Claim 2, wherein said opening has an aspect ratio of at least 2.5 (W/H).

21. A metallization layer formed by a process comprising:

i) depositing a seed layer of a metal on a first substrate surface, said seed layer being sufficient to cover said first substrate surface;

ii) depositing a second amount of metal on said seed layer at a substrate temperature and power, providing a metal diffusion rate and a second metal deposition rate sufficient to inhibit void formation in an opening having an aspect ratio of at least 1.0; and

iii) depositing a third amount of metal on said second amount of metal.